

STATIONARY SOURCE PERMIT TO OPERATE

In compliance with the Federal Clean Air Act and the Commonwealth of Virginia Regulations for the Control and Abatement of Air Pollution,

Hampton University
E. Queen Street
Hampton, Virginia 23688
Registration No.: 60106

is authorized to operate

a co-educational institution of higher education

located at

E. Queen Street
Hampton, Virginia

in accordance with the Conditions of this permit.

Approved on **August DRAFT, 2007.**

Francis L. Daniel

Permit consists of 8 pages.
Permit Conditions 1 to 19.
Appendix A
Appendix B

INTRODUCTION

1. This permit approval is based on the permit application dated March 28, 2007. Any changes in the permit application specifications or any existing facilities which alter the impact of the facility on air quality may require a permit. Failure to obtain such a permit prior to construction may result in enforcement action.

Words or terms used in this permit shall have meanings as provided in 9 VAC 5-10-10 of the State Air Pollution Control Board Regulations for the Control and Abatement of Air Pollution. The regulatory reference or authority for each condition is listed in parentheses () after each condition.

Annual requirements to fulfill legal obligations to maintain current stationary source emissions data will necessitate a prompt response by the permittee to requests by the DEQ or the Board for information to include, as appropriate: process and production data; changes in control equipment; and operating schedules. Such requests for information from the DEQ will either be in writing or by personal contact.

The availability of information submitted to the DEQ or the Board will be governed by applicable provisions of the Freedom of Information Act, §§ 2.2-3700 through 2.2-3714 of the Code of Virginia, § 10.1-1314 (addressing information provided to the Board) of the Code of Virginia, and 9 VAC 5-170-60 of the State Air Pollution Control Board Regulations. Information provided to federal officials is subject to appropriate federal law and regulations governing confidentiality of such information.

PROCESS REQUIREMENTS

2. **Equipment List** - Equipment at this facility consists of the following:

Equipment to be operated				
Reference No.	Equipment Description	Rated Capacity	Federal Requirements	Fuel
B-1	Riley Stoker Boiler (Steam Plant) – 1945	34 mmBTU/hr	NA	Coal
B-2	Riley Stoker Boiler (Steam Plant) – 1945	34 mmBTU/hr	NA	Coal
B-3	Riley Boiler (Steam Plant) – 1945	19 mmBTU/hr	NA	Distillate Oil
B-4	Keeler Boiler (Steam Plant) – 1966	23 mmBTU/hr	NA	Distillate Oil
B-5	Keeler Boiler (Steam Plant) – 1966	28 mmBTU/hr	NA	Distillate Oil
B-6	Hurst Boiler (Model #F650; Steam Plant) – 1971	4 mmBTU/hr	NA	Paper pellets / wood chips
B-7	Cleaver Brooks Boiler (Model #CB.200-100; University Cleaners)	4.184 mmBTU/hr	NA	Natural gas / diesel oil
B-8	Burnham Boiler (Model #4FL.360.A.45.LB; Queen St. Dorm)	3.348 mmBTU/hr	NA	Natural gas / diesel oil
B-9	Kewanee Boiler (Model #M-265-KO; Queen St. Dorm)	3.313 mmBTU/hr	NA	Natural gas / diesel oil

EG-1 to EG-25	Emergency Generators			Distillate Oil or Dual fuel (natural gas and/or diesel)
10	Dry Cleaning equipment (Union, UN-850 U2000 Series, including a totally enclosed condenser) and a Water Chiller System (KR Products, DC Line 7.5 ton, KR-OP7.5) – 2006	50 lbs of soiled clothing per load	40 CFR 63, Subpart M	

Exempted Equipment				
Reference No.	Equipment Description	Rated Capacity	Federal Requirements	Exempt Date
B-10	Columbia Boiler (Model # CR2G20B; Strawberry Bank Dorm)	2.52 mmBTU/hr	NA	March 1, 2007

Specifications included in the permit under this Condition are for informational purposes only and do not form enforceable terms or conditions of the permit.

(9 VAC 5-80-850)

OPERATING LIMITATIONS

3. **Fuel** - The approved fuels for the boilers B-1 to B-10 as stated in condition 2. A change in the fuel may require a permit to modify and operate.
(9 VAC 5-80-850)
4. **Fuel** - The approved fuels for the emergency generators EG-1 to EG 25 is distillate oil and or natural gas. A change in the fuel may require a permit to modify and operate.
(9 VAC 5-80-850)
5. **Fuel Throughput** - The facility shall consume no more than 7,200 tons of coal per year calculated monthly as the sum of each consecutive 12-month period. Compliance for the consecutive 12-month period shall be demonstrated monthly by adding the total for the most recently completed calendar month to the individual monthly totals for the preceding 11 months.
(9 VAC 5-80-850)

6. **Fuel** - The coal shall meet the specifications below:

COAL:

Maximum chloride content: 0.123 lb [Cl] per 100lbs coal

(9 VAC 5-80-850)

7. **Fuel Certification** - The permittee shall obtain a certification from the fuel supplier with each shipment of coal. Each fuel supplier certification shall include the following:

- a. The name of the coal supplier;
- b. The date on which the coal was received; and
- c. The quantity of coal delivered in the shipment.

Fuel sampling and analysis, independent of that used for certification, as may be periodically required or conducted by DEQ may be used to determine compliance with the fuel specifications stipulated in Condition number 5. Exceedance of these specifications may be considered credible evidence of the exceedance of emission limits.

(9 VAC 5-80-850)

HAP EMISSION LIMITS

8. **HAP Emission Limits** – Hazardous air pollutant (HAP) emissions, as defined by §112(b) of the Clean Air Act, from the stationary source shall not exceed 10 tons per year of any individual HAP or 25 tons per year of any combination, calculated monthly as the sum of each consecutive 12 month period using the following formulas. HAPs which are not accompanied by a specific CAS number shall be calculated as the sum of all compounds containing the named chemical when determining compliance with the individual HAP emissions limitation of 10 tons per year.

$$a. \text{ Total HAPs(tons/yr)} = \frac{\left[\sum_{i=1}^4 \text{Fuel}_i \times EF_{HAPs_i} \right] + \left[\left(\sum_{i=1}^n \frac{\text{MMBtu}_i}{\text{hr}} \times \text{hr}_i \right) \times EF_{GenHAPs} \right]}{2000\text{lbs}} + [PERC]$$

Where:

Fuel_i = Total throughput of each boiler fuel type per year as a 12 month rolling sum (tons/yr of coal, 1000 gals/yr of oil, tons/yr of wood pellets, million cubic feet per year of natural gas).

EF_{HAPs_i} = Total HAP emission factors for each boiler fuel type (lbs/ton of coal, lbs/1000 gals of oil, lbs/tons of wood pellets, lbs/million cubic feet of natural gas) from Table 1 of Appendix B of this permit.

n = Total number of emergency generators.

MMBtu/hr_i = Rated capacity of each emergency generator as shown in the compliance example in Table 2 of Appendix A of this permit.

Hr_i = Operational hours per year of each generator.

$EF_{Gen\ HAPS}$ = Total HAP emission factor for generators (lbs/MMBtu) from Table 2 of Appendix B of this permit.

PERC = Total amount of PERC (tons/yr) emitted from the dry cleaning operations.

- b. HCL, being the highest individual HAP at the facility, shall be calculated as:

$$HCL(\text{tons/yr}) = \frac{\left[\sum_{i=1}^4 Fuel_i \times EF_{HCL_i} \right]}{2000\text{lbs}}$$

Where:

$Fuel_i$ = Total throughput of each boiler fuel type per year as a 12-month rolling sum (tons/yr of coal, 1000 gals/yr of oil, tons/yr of wood pellets, million cubic feet per year of natural gas).

$EF_{HCL\ i}$ = HCL emission factor for each boiler fuel type (lbs/ton of coal, lbs/1000 gals/yr of oil, lbs/tons of wood pellets, lbs/million cubic feet per year of natural gas) from Table 1 of Appendix B of this permit.

These emissions are derived from the estimated overall emission contribution from operating limits. Exceedance of the operating limits may be considered credible evidence of the exceedance of emission limits. Compliance with these emission limits may be determined as stated in Condition number 5. (9 VAC 5-80-850)

COMPLIANCE DETERMINATION

9. **Fuel Sampling and Analysis** – The permittee shall sample and analyze fuel from at least one shipment of coal annually to determine the chlorine concentration in the coal sample at a 90% confidence level as calculated in 40 CFR 63.7530(d). The chlorine concentration data shall be used to update the applicable HCL emission factor for coal-fired boilers, B-1 and B-2, and to determine the hydrogen chloride emissions from the boilers. Fuel sampling and analysis shall be conducted in accordance with 40 CFR 63 Subpart DDDDD Table 6 paragraphs 3.a, b, c, and f (or other DEQ approved methods) for hydrogen chloride. (9 VAC 5-80-880)

RECORDS AND REPORTING

10. **On Site Records** - The permittee shall maintain records of emission data and operating parameters as necessary to demonstrate compliance with this permit. The content and format of such records shall be arranged with the Director, Tidewater Regional Office. These records shall include, but are not limited to:
- a. Annual consumption of coal calculated monthly as the sum of each consecutive 12-month period. Compliance for the consecutive 12-month period shall be demonstrated monthly by adding the total for the most recently completed calendar month to the individual monthly totals for the preceding 11 months.

- b. Fuel supplier certifications.
- c. 12-month rolling emissions calculations, performed monthly, for HAPs from the boilers (B-1 to B-10), emergency generators (EG-1 to EG-25) and dry cleaning equipment using calculation methods approved by the Director, Tidewater Regional Office to verify compliance with the tons/yr emissions limitation in Condition 8.
- d. 12-month rolling emissions calculations, performed monthly, for HCl from the boilers (B-1 to B-10) and emergency generators (EG-1 to EG-25) using calculation methods approved by the Director, Tidewater Regional Office to verify compliance with the tons/yr emissions limitation in Condition 8.
- e. Results of all fuel analyses.

These records shall be available for inspection by the DEQ and shall be current for the most recent five years.

(9 VAC 5-80-850 and 9 VAC 5-50-50)

11. **Testing/Monitoring Ports** - The permitted facility shall be constructed so as to allow for emissions testing and monitoring upon reasonable notice at any time, using appropriate methods. Test ports shall be provided when requested at the appropriate locations.

(9 VAC 5-80-880 and 9 VAC 5-80-850)

12. **Reporting** – The permittee shall submit annual HAP calculations to the Director, Tidewater Regional Office. These calculations shall include the 12-month rolling emissions calculations for each month during the previous year. The HAP calculations can be submitted with the annual Title V emission statement.

(9 VAC 5-80-850 and 9 VAC 5-50-50)

GENERAL CONDITIONS

13. **Right of Entry** - The permittee shall allow authorized local, state, and federal representatives, upon the presentation of credentials:

- a. To enter upon the permittee's premises on which the facility is located or in which any records are required to be kept under the terms and conditions of this permit;
- b. To have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit or the State Air Pollution Control Board Regulations;
- c. To inspect at reasonable times any facility, equipment, or process subject to the terms and conditions of this permit or the State Air Pollution Control Board Regulations; and
- d. To sample or test at reasonable times.

For purposes of this condition, the time for inspection shall be deemed reasonable during regular business hours or whenever the facility is in operation. Nothing contained herein shall make an inspection time unreasonable during an emergency.

(9 VAC 5-170-130 and 9 VAC 5-80-850)

14. **Notification for Facility or Control Equipment Malfunction** - The permittee shall furnish notification to the Director, Tidewater Regional Office of malfunctions of the affected facility or related air pollution control equipment that may cause excess emissions for more than one hour, by facsimile transmission, telephone, or telegraph. Such notification shall be made as soon as practicable but no later than four daytime business hours after the malfunction is discovered. The permittee shall provide a written statement giving all pertinent facts, including the estimated duration of the breakdown, within two weeks of discovery of the malfunction. When the condition causing the failure or malfunction has been corrected and the equipment is again in operation, the permittee shall notify the Director, Tidewater Regional Office in writing.
(9 VAC 5-20-180 C and 9 VAC 5-80-850)
15. **Violation of Ambient Air Quality Standard** - The permittee shall, upon request of the DEQ, reduce the level of operation or shut down a facility, as necessary to avoid violating any primary ambient air quality standard and shall not return to normal operation until such time as the ambient air quality standard will not be violated.
(9 VAC 5-20-180 I and 9 VAC 5-80-850)
16. **Maintenance/Operating Procedures** – At all times, including periods of start-up, shutdown, soot blowing, and malfunction, the permittee shall, to the extent practicable, maintain and operate the affected source, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions.
(9 VAC 5-50-20 E and 9 VAC 5-80-850)
17. **Permit Suspension/Revocation** - This permit may be revoked if the permittee:
- a. Knowingly makes material misstatements in the permit application or any amendments to it;
 - b. Fails to comply with the terms or conditions of this permit;
 - c. Fails to comply with any emission standards applicable to a permitted emissions unit;
 - d. Causes emissions from this facility which result in violations of, or interferes with the attainment and maintenance of, any ambient air quality standard;
 - e. Fails to operate this facility in conformance with any applicable control strategy, including any emission standards or emission limitations, in the State Implementation Plan in effect at the time that an application for this permit is submitted; or
 - f. Fails to comply with the applicable provisions of Articles 6, 8 and 9 of 9 VAC 5 Chapter 80.
- (9 VAC 5-80-1010)

18. **Change of Ownership** - In the case of a transfer of ownership of a stationary source, the new owner shall abide by any current permit issued to the previous owner. The new owner shall notify the Director, Tidewater Regional Office of the change of ownership within 30 days of the transfer.
(9 VAC 5-80-940)
19. **Permit Copy** - The permittee shall keep a copy of this permit on the premises of the facility to which it applies.
(9 VAC 5-80-860 D)

DRAFT PERMIT APPROVAL FORM

Department of Environmental Quality
Tidewater Regional Office
5636 Southern Blvd.
Virginia Beach, Virginia 23462

Instructions:

The "Draft Permit Approval Form" provides the owner or certified company official an opportunity to accept or suggest appropriate changes to a draft permit. If a signed form is not received within one (1) week of the date of receipt of the draft permit, DEQ will assume that the draft permit is considered acceptable and will proceed with processing the permit. **Please check the applicable statement(s) below after thoroughly reviewing the draft permit. Forms may be returned by facsimile to 757-518-2009.**
Attention: Cindy Keltner or Ms. Jane A. Workman.

_____ The owner or certified company official agrees with the conditions of the draft permit dated _____ . Please proceed to issue the permit with no change.

_____ The owner or certified company official finds condition number(s) _____ of the draft permit dated _____ unacceptable.

_____ The suggested changes are attached for your consideration.

_____ The owner or certified company official requests further discussion with DEQ regarding the above referenced condition(s).

Signature: _____

Name: _____

Title: _____

Facility: _____

Date: _____

APPENDIX A

HAZARDOUS AIR POLLUTANT COMPLIANCE EXAMPLE

The following is a completed example for compliance using the formulas from the previous page and example values for throughputs and hours of operation for each piece of HAP emitting equipment. The calculation of HAP emissions also utilize the emission factors shown in Tables 1 and 2 of Appendix B. The throughputs represented are similar to actual values but they are not intended to become permit limits. This example is provided to show confidence that compliance will be achieved using the proposed compliance approach.

Table 1: Boiler HAP Summary

Boiler Fuel	Boiler Fuel Throughput	Total HAPS (tons/yr)	HCI Emissions (ton/yr)
Coal (tons/yr)	4,926	9.17	4.56
Fuel Oil (gal/yr)	4,519,400	0.91	0.78
Paper Pellets (ton/yr)	69	0.02	0.01
Natural Gas (10 ⁶ cf/yr)	12.50	0.03	--
Total HAP Emissions		10.1	
Total HCL Emissions			5.4

Table 2: Emergency Generator HAP Summary

Emergency Generator ID	Rated Capacity (MMBtu/hr)	Hours / Year	MMBtu / Year
EG-1	0.05	500	25.6
EG-2	0.43	500	213.1
EG-3	0.26	500	127.9
EG-4	0.10	500	51.2
EG-5	0.34	500	170.5
EG-6	0.43	500	213.1
EG-7	0.24	500	119.4
EG-8	0.51	500	255.8
EG-9	2.05	500	1023.0
EG-10	0.10	500	51.2
EG-11	0.77	500	383.6
EG-12	0.03	500	12.8
EG-13	0.11	500	54.6
EG-14	0.78	500	392.2
EG-15	0.34	500	170.5
EG-16	0.51	500	255.8
EG-17	0.26	500	127.9
EG-18	0.77	500	383.6
EG-19	1.02	500	511.5
EG-20	0.26	500	127.9
EG-21	0.09	500	42.6
EG-22	0.24	500	119.4
EG-23	2.05	500	1023.0
EG-24	0.61	500	306.9
EG-25	0.14	500	68.2
TOTAL (MMBtu)			6230.9
TOTAL EMISSIONS (ton/yr)			0.009

Table 3: Overall HAP Compliance

Emission Source	Total HAPS (ton/yr)	HCI (ton/yr)
Boilers	10.1	5.4
Generators	0.009	--
Dry Cleaning ¹	5.6	--
Total	15.7	5.4

Notes:

1. Current Permit Limit

APPENDIX B

SUMMARY OF EMISSION FACTORS TO BE USED AS BASIS FOR SOP EMISSION ESTIMATES

Table 1: Emission Factor Summary for Boiler Fuels

Equipment Type	Equipment ID Number	Pollutant	Emission Factor	EF Units
Coal-Fired Boilers	B-1, B-2	TOTAL HAP	3.724	lb/ton
Coal-Fired Boilers	B-1, B-2	HCl	1.851	lb/ton
Oil-Fired Boilers	B-3, B-3, B-5	TOTAL HAP	0.403	lb/10 ³ gal
Oil-Fired Boilers	B-3, B-4, B-5	HCl	0.347	lb/10 ³ gal
Paper Pellet-Fired Boiler	B-6	TOTAL HAP	0.596	lb/ton
Paper Pellet-Fired Boiler	B-6	HCl	0.304	lb/ton
Nat. Gas-Fired Boilers	B-7, B-8, B-9, B-10	TOTAL HAP	4.288	lb/10 ⁶ cf

Table 2: Emission Factor Summary for Generators

Oil/Dual Fuel Emergency Generators	EG-1 - EG-25	TOTAL HAP	0.003	lb/MMBtu
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APPENDIX B

HAP EMISSION FACTORS - COAL

Table 3: Emission Factor Breakdown for Coal

Air Pollutant	AP-42 Emission Factor lb/ton	AP-42 Applied Control Efficiency *	Uncontrolled Emission Factor	Ref.
Doxins/Furans	1.76E-09	0	1.76E-09	AP-42, 1.1
Biphenyl	1.70E-06	0	1.70E-06	AP-42, 1.1
Acenaphthene	5.10E-07	0	5.10E-07	AP-42, 1.1
Naphthalene	1.30E-05	0	1.30E-05	AP-42, 1.1
Acetaldehyde	5.70E-04	0	5.70E-04	AP-42, 1.1
Acetophenone	1.50E-05	0	1.50E-05	AP-42, 1.1
Acrolein	2.90E-04	0	2.90E-04	AP-42, 1.1
Benzene	1.30E-03	0	1.30E-03	AP-42, 1.1
Benzyl chloride	7.00E-04	0	7.00E-04	AP-42, 1.1
Bromoform	3.90E-05	0	3.90E-05	AP-42, 1.1
Carbon disulfate	1.30E-04	0	1.30E-04	AP-42, 1.1
2-Chloroacetophenone	7.00E-06	0	7.00E-06	AP-42, 1.1
Chlorobenzene	2.20E-05	0	2.20E-05	AP-42, 1.1
Chloroform	5.90E-05	0	5.90E-05	AP-42, 1.1
Cumene	5.30E-06	0	5.30E-06	AP-42, 1.1
Cyanide	2.50E-05	0	2.50E-05	AP-42, 1.1
2,4-Dinitrotoluene	2.80E-07	0	2.80E-07	AP-42, 1.1
Dimethyle sulfate	4.80E-05	0	4.80E-05	AP-42, 1.1
Ethyl benzene	9.40E-05	0	9.40E-05	AP-42, 1.1
Ethyl chloride	4.20E-05	0	4.20E-05	AP-42, 1.1
Ethylene dibromide	1.20E-06	0	1.20E-06	AP-42, 1.1
Formaldehyde	2.40E-04	0	2.40E-04	AP-42, 1.1
Hexane	6.70E-05	0	6.70E-05	AP-42, 1.1
Hydrogen fluoride	0.15	0	1.50E-01	AP-42, 1.1
Isophorone	5.80E-04	0	5.80E-04	AP-42, 1.1
Methyl bromide	1.60E-04	0	1.60E-04	AP-42, 1.1
Methyl chloride	5.30E-04	0	5.30E-04	AP-42, 1.1
Methyl hydrazine	1.70E-04	0	1.70E-04	AP-42, 1.1
Methyl methacrylate	2.00E-05	0	2.00E-05	AP-42, 1.1
Methyl tert butyle ether	3.50E-05	0	3.50E-05	AP-42, 1.1
Methylene chloride	2.90E-04	0	2.90E-04	AP-42, 1.1
Phenol	1.60E-05	0	1.60E-05	AP-42, 1.1
Propionaldehyde	3.80E-04	0	3.80E-04	AP-42, 1.1
Tetrachloroethylene	4.30E-05	0	4.30E-05	AP-42, 1.1
Toluene	2.40E-04	0	2.40E-04	AP-42, 1.1
1,1,1-Trichloroethane	2.00E-05	0	2.00E-05	AP-42, 1.1
Styrene	2.50E-05	0	2.50E-05	AP-42, 1.1
Xylenes	3.70E-05	0	3.70E-05	AP-42, 1.1
Vinyl acetate	7.60E-06	0	7.60E-06	AP-42, 1.1
Antimony	1.80E-05	99.8	9.00E-03	AP-42, 1.1
Arsenic	4.10E-04	99.8	2.05E-01	AP-42, 1.1
Beryllium	2.10E-05	99.8	1.05E-02	AP-42, 1.1
Cadmium	5.10E-05	99.8	2.55E-02	AP-42, 1.1
Chromium	2.60E-04	99.8	1.30E-01	AP-42, 1.1
Cobalt	1.00E-04	99.8	5.00E-02	AP-42, 1.1
Lead	4.20E-04	99.8	2.10E-01	AP-42, 1.1
Manganese	4.90E-04	99.8	2.45E-01	AP-42, 1.1
Nickel	2.80E-04	99.8	1.40E-01	AP-42, 1.1
Mercury	8.30E-05	99.8	4.15E-02	AP-42, 1.1
Selenium	1.30E-03	99.8	6.50E-01	AP-42, 1.1
Hydrogen chloride	1.85E+00	0	1.851	Fuel Test
TOTAL HAP EMISSION FACTOR (lb/ton)			3.724	

* Emission factors are "controlled" factors based on hypothetical use of fabric filter at an efficiency of 99.8%.

APPENDIX B

HAP EMISSION FACTORS - NO. 2 FUEL OIL

Table 4: Emission Factor Breakdown for Fuel Oil

Air Pollutant	AP-42 Emission Factor	Units	Uncontrolled Emission Factor lb/gal *	Ref.
Arsenic	4.0E+00	lb/10 ¹² Btu	5.6E-04	AP-42, 1.3
Beryllium	3.0E+00	lb/10 ¹² Btu	4.2E-04	AP-42, 1.3
Cadmium	3.0E+00	lb/10 ¹² Btu	4.2E-04	AP-42, 1.3
Chromium	3.0E+00	lb/10 ¹² Btu	4.2E-04	AP-42, 1.3
Cobalt	6.0E+00	lb/10 ¹² Btu	8.4E-04	AP-42, 1.3
Lead	9.0E+00	lb/10 ¹² Btu	1.3E-03	AP-42, 1.3
Manganese	6.0E+00	lb/10 ¹² Btu	8.4E-04	AP-42, 1.3
Nickel	3.0E+00	lb/10 ¹² Btu	4.2E-04	AP-42, 1.3
Mercury	3.0E+00	lb/10 ¹² Btu	4.2E-04	AP-42, 1.3
Selenium	1.5E+01	lb/10 ¹² Btu	2.1E-03	AP-42, 1.3
Formaldehyde	4.8E-02	lb/10 ³ gal	4.8E-02	AP-42, 1.3
Hydrogen chloride	3.5E-01	lb/10 ³ gal	3.5E-01	AP-42, 1.3 **
TOTAL HAP EMISSION FACTOR (lb/10³ gal)			0.403	

* Based on 140,000 Btu/gal of oil.

** No HCl emission factor for No. 2 fuel oil; HCl emission factor for No. 6 fuel oil used

APPENDIX B

HAP EMISSION FACTORS - WOOD RESIDUE

Table 5: Emission Factor Breakdown for Wood/Paper Pellets

Air Pollutant	AP-42 Emission Factor lb/MMBtu	Uncontrolled Emission Factor lb/ton *	Ref.
Acetaldehyde	8.30E-04	1.33E-02	AP-42, 1.6
Acetophenone	3.20E-09	5.12E-08	AP-42, 1.6
Acrolein	4.00E-03	6.40E-02	AP-42, 1.6
Benzene	4.20E-03	6.72E-02	AP-42, 1.6
Carbon tetrachloride	4.50E-05	7.20E-04	AP-42, 1.6
Chlorine	7.90E-04	1.26E-02	AP-42, 1.6
Chlorobenzene	3.30E-05	5.28E-04	AP-42, 1.6
Chloroform	2.80E-05	4.48E-04	AP-42, 1.6
1,2-Dichloroethene	2.90E-05	4.64E-04	AP-42, 1.6
2,4-Dinitrophenol	1.80E-07	2.88E-06	AP-42, 1.6
Ethylbenzene	3.10E-05	4.96E-04	AP-42, 1.6
Formaldehyde	4.40E-03	7.04E-02	AP-42, 1.6
Naphthalene	9.70E-05	1.55E-03	AP-42, 1.6
4-Nitrophenol	1.10E-07	1.76E-06	AP-42, 1.6
Pentachlorophenol	5.10E-08	8.16E-07	AP-42, 1.6
Phenol	5.10E-05	8.16E-04	AP-42, 1.6
Propionaldehyde	6.10E-05	9.76E-04	AP-42, 1.6
Styrene	1.90E-03	3.04E-02	AP-42, 1.6
Tetrachlorodibenzop-p	4.70E-10	7.52E-09	AP-42, 1.6
Antimony	7.90E-06	1.26E-04	AP-42, 1.6
Arsenic	2.20E-05	3.52E-04	AP-42, 1.6
Cadmium	4.10E-06	6.56E-05	AP-42, 1.6
Chromium	2.10E-05	3.36E-04	AP-42, 1.6
Cobalt	6.50E-06	1.04E-04	AP-42, 1.6
Lead	4.80E-05	7.68E-04	AP-42, 1.6
Manganese	1.60E-03	2.56E-02	AP-42, 1.6
Mercury	3.50E-06	5.60E-05	AP-42, 1.6
Nickel	3.30E-05	5.28E-04	AP-42, 1.6
Phosphorus	2.70E-05	4.32E-04	AP-42, 1.6
Selenium	2.80E-06	4.48E-05	AP-42, 1.6
Hydrogen chloride	1.90E-02	3.04E-01	AP-42, 1.6
TOTAL HAP EMISSION FACTOR (lb/ton)		0.596	

* Based on 8000 Btu/lb of pellets (assuming the same as wood residue).

APPENDIX B

HAP EMISSION FACTORS - NATURAL GAS

Table 6: Emission Factor Breakdown for Natural Gas

Air Pollutant	Uncontrolled AP-42 Emission Factor lb/10 ⁶ cf	Ref. *
Lead	5.00E-04	AP-42, 1.1
2-Methylnaphthalene	2.40E-05	AP-42, 1.1
3-Methylchloranthrene	9.00E-07	AP-42, 1.1
7,12-Dimethylbenz(a)anthracene	8.00E-06	AP-42, 1.1
Acenaphthene	9.00E-07	AP-42, 1.1
Acenaphthylene	9.00E-07	AP-42, 1.1
Anthracene	1.20E-06	AP-42, 1.1
Benz(a)anthracene	9.00E-07	AP-42, 1.1
Benzene	2.10E-03	AP-42, 1.1
Benzo(a)pyrene	6.00E-07	AP-42, 1.1
Benzo(b)fluoranthene	9.00E-07	AP-42, 1.1
Benzo(g,h,i)perylene	6.00E-07	AP-42, 1.1
Benzo(k)fluoranthene	9.00E-07	AP-42, 1.1
Chrysene	9.00E-07	AP-42, 1.1
Dibenzo(a,h)anthracene	6.00E-07	AP-42, 1.1
Dichlorobenzene	1.20E-03	AP-42, 1.1
Fluoranthene	3.00E-06	AP-42, 1.1
Fluorene	2.80E-06	AP-42, 1.1
Formaldehyde	7.50E-02	AP-42, 1.1
Hexane	1.8	AP-42, 1.1
Indeno(1,2,3-cd)pyrene	9.00E-07	AP-42, 1.1
Naphthalene	6.10E-04	AP-42, 1.1
Phenanthrene	1.70E-05	AP-42, 1.1
Pyrene	5.00E-06	AP-42, 1.1
Toluene	3.40E-03	AP-42, 1.1
Arsenic	2.40E+00	AP-42, 1.1
Beryllium	6.00E-06	AP-42, 1.1
Cadmium	1.10E-03	AP-42, 1.1
Chromium	1.40E-03	AP-42, 1.1
Cobalt	8.40E-05	AP-42, 1.1
Manganese	3.80E-04	AP-42, 1.1
Nickel	2.10E-03	AP-42, 1.1
Mercury	2.60E-04	AP-42, 1.1
Selenium	1.20E-05	AP-42, 1.1
TOTAL HAP EMISSION FACTOR (lb/10⁶ cf)	4.29	

* No HCl emission factor for natural gas-fired boiler found in AP-42.

APPENDIX B

HAP EMISSION FACTORS - INTERNAL COMBUSTION ENGINES

Table 7: Emission Factor Breakdown Combustion in Generators

Emission Unit	Fuel	Air Pollutant	AP-42 Emission Factors lb/MMBtu	Ref.*
Small EGs	No. 2 FO	Acetaldehyde	7.67E-04	AP-42, 3.3
Small EGs	No. 2 FO	Acrolein	4.63E-05	AP-42, 3.3
Small EGs	No. 2 FO	Benzene	9.33E-04	AP-42, 3.3
Small EGs	No. 2 FO	Acrolein	4.63E-05	AP-42, 3.3
Small EGs	No. 2 FO	Naphthalene	8.48E-05	AP-42, 3.3
EG-23 and Dual Fuel EGs	No. 2 FO and Dual Fuel	Acetaldehyde	2.52E-05	AP-42, 3.4
EG-23 and Dual Fuel EGs	No. 2 FO and Dual Fuel	Acrolein	7.88E-06	AP-42, 3.4
EG-23 and Dual Fuel EGs	No. 2 FO and Dual Fuel	Benzene	7.76E-04	AP-42, 3.4
EG-23 and Dual Fuel EGs	No. 2 FO and Dual Fuel	Formaldehyde	7.89E-05	AP-42, 3.4
EG-23 and Dual Fuel EGs	No. 2 FO and Dual Fuel	Toluene	2.81E-04	AP-42, 3.4
EG-23 and Dual Fuel EGs	No. 2 FO and Dual Fuel	Xylenes	1.93E-04	AP-42, 3.4
TOTAL HAP EMISSION FACTOR (lb/MMBtu)			0.003	

* No HCl emission factor for internal combustion engines found in AP-42.